JOURNAL

American Society of Tool Engineers

FEBRUARY, 1934

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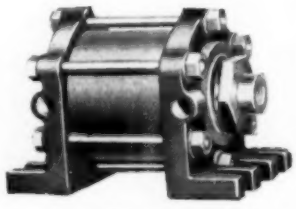

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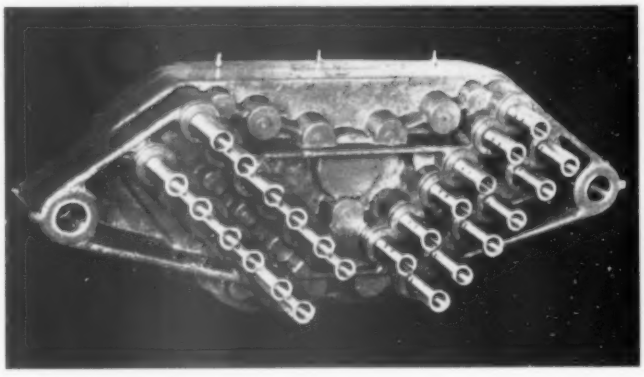

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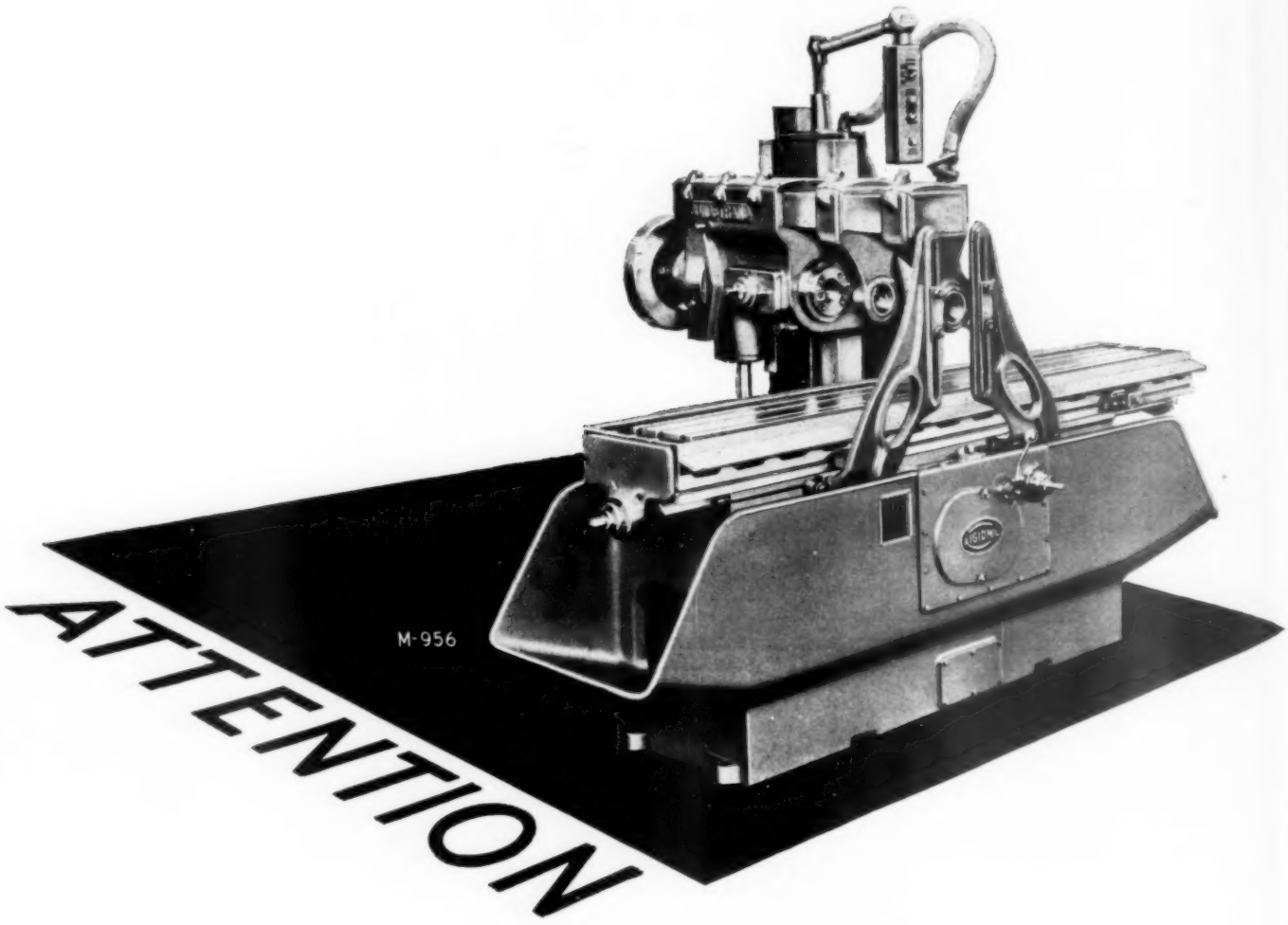

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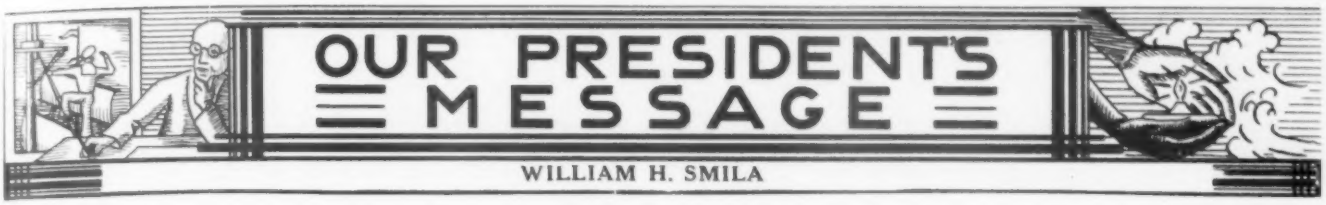


ELECTION OF OFFICERS

AT our next regular meeting to be held February 8th, 1934, in the General Motors Building, will occur the election of a nominating committee. Upon this committee will rest the responsibility of selecting the candidates for the various offices of the A.S.T.E. to serve the Society for one year beginning April first. The present officers of the Society earnestly request your presence and wholehearted co-operation in the affairs of the Society. Your attendance at all meetings will be a great help to the officers, and the welfare of the Society. It rests with the membership to decide whether, what has been built by much personal devotion and sacrifice in the past shall be conserved, or whether for lack of co-operation it shall be obliged to surrender its position of leadership among the various engineering societies of the City.

There are many ways in which we can all help. Retaining our membership in the Society even at the cost of a litt'e sacrifice, by the prompt payment of dues where it is possible to do so,—your secretary will greatly appreciate this; regular attendance at our meetings, which will be appreciated by all officers, meetings committee, and the speakers themselves; and through the acquisition of new members which can be done by showing interest ourselves. Your representatives are trying to do their part. We are appealing to you for your help, and sincerely hope you will co-operate with us.

The Society derives the principal part of its revenue from dues paid by the members. These dues are made as low as consistently possible so as to be as small a burden as possible thereby allowing many members to retain their membership that otherwise would be compelled to drop out. It requires considerable money to pay the Society's running expenses and if the dues are not paid it will necessitate drafts on our treasury to cover these expenses. This would not be a healthy condition and no organization could long exist under such circumstances. Our society is incorporated under the laws of Michigan as a non-profit corporation and we have no intention of creating a large treasury, but in the interest of good management we expect to keep our expenses within our income.

The Society through the Industrial Relations Committee have placed many of our members in positions. In fact, during the past month we placed seventeen jobless men in positions. Over half of these men were not members of our Society, but as the Industrial Relations Committee ran out of applicants from our membership the committee filled vacancies from capable non-members known to the committee to be seeking jobs. If any member is out of employment and wishes to be employed he should file an application with the Secretary of the Society.

JANUARY MEETING

The January Meeting of the American Society of Tool Engineers was held at the Detroit-Leland Hotel on January 11. The meeting was preceded by a dinner at which 75 were served. An equal number arrived later to attend the meeting.

Three reels of very interesting film were shown after which Mr. A. W. Schneider of the Heald Machine Company presented the paper which follows.

The meeting was very interesting throughout and was enjoyed by all.

THE DEVELOPMENT OF PRECISION BORING

By A. W. SCHNEIDER, manager, Borematic Division
Heald Machine Company

The history of boring goes back to the beginning of culture when tools were first made of wood and stone. In the stone age the first tools were made of pointed wood. To secure cutting action the tips were impregnated with a flint powder which in turn cut the stone. The boring by this method was, of course, slow and to increase production and increase accuracy "hollow boring" was introduced.

The original "hollow drill" was nothing more than a bone with the marrow removed. The cutting action was supplied by the powdered stone loosened by the rotation of the tool. Crude as it was, its boring production was almost double that of the wood drill.

The boring tools were at first rotated by hand, but very early in civilization the first boring machine, the "fiddle drill" was developed. This first machine consisted of a bow with the stringed portion wound around the drill, a stroking action similar to that of the bull fiddle player in an orchestra imparting the rotation to the tool.

After man discovered the use of fire, metal was discovered. The Egyptians knew copper in 4500 B.C. and bronze by 300 B.C. As bronze was soft and mostly cast, the cutting tools of that age were mostly stone. The first record of iron boring-tools dates back to 265 A.D. when we find remains of Roman drills, flat pointed with square shanks.

The Middle Ages contributed little to the development of metal working and it is not again until 1500 that we find many developments in this field. About this time with the development of pistols and cannon, there arose the demand for the boring of larger and deeper holes in iron. The first known design of a boring machine is that made by Leonardo de Vinci. De Vinci was among the first of the now vanishing "all round mechanics." He was painter of that famous mural, "The Last Supper," and a sculptor of the first rank. He also laid out many canals, designed a flying machine, which crashed, and invented the breech loading cannon. His boring machine, with a wood base, a centralizing chuck and an outboard support for his boring bar, was probably designed to bore his cannon.

The motive power of these earlier machines was mostly the tread-wheel-drive, and as late as 1774 a patent was issued in England for a machine with this drive for boring a cannon from the solid. In 1775 Wilkinson developed a boring machine to machine the cylinders for Watts' contribution to the mechanical world, the steam engine. It is interesting to note that the machine was developed because of the lack of any methods then used, to give a better roundness of hole than within $\frac{1}{8}$".

(*Continued on page 7*)

"See page 6 for important next meeting announcement."

FEBRUARY MEETING

Thursday, February 8

GENERAL MOTORS BUILDING*

A JOINT MEETING WITH THE DETROIT CHAPTER OF THE SOCIETY OF INDUSTRIAL ENGINEERS

Dinner: 6:30, in Cafeteria (Obtain tickets at the door—$1.00, including checking)

Call Madison 2057 for Dinner Reservations

Technical Sesssion: 8:00, Same Place

INDUSTRIAL MOBILIZATION PLANS

of the

U. S. ARMY AIR CORPS

By

ROBERT W. ACKLEY

***Note Change of Meeting Place.**

The subject of Mr. Ackley's talk is of general interest and importance to every citizen, but of very significant and direct interest to manufacturing executives, all members of the A.S.T.E., and all others who are involved or interested in mass production.

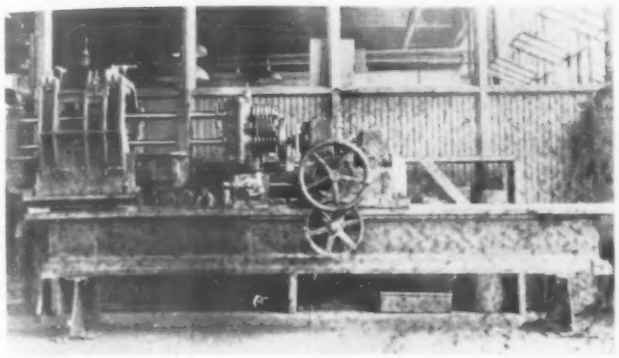
Much has been seen lately of war and peace in the daily press and it becomes the patriotic duty of us all to learn as much as possible about the preparations planned to meet an emergency. We are privileged in having the subject presented in such an authorative manner. The talk will be amplified by recently made moving pictures. Mr. Ackley will outline how each individual factory will be organized to cooperate in national unison.

Mr. Ackley is a graduate mechanical engineer from the class of 1923 U. of M. His background of industrial experience so well fitting him for his present position as Procurement Planning Assistant U. S. Army Air Corps consists of two years with the American Blower Company in Detroit: two years with the Chicago and Detroit engaged in industrial war-planning work.

All members are urged to bring their friends especially those engaged in manufacturing.

Mr. C. E. Johansson who it was announced last month was scheduled to address the February meeting did not return from Europe in time to keep the appointment. He will be the key-note speaker at our March meeting.

Ever since the Society has been formed we have had our headquarters at the Detroit-Leland Hotel. Due to the fact that the Hotel Company contemplate changing the "Colonnade Room" into a night club it will be necessary for the Society to find new quarters, or take a chance on using the main dining room or the ball room for our meetings. This is entirely out of the question as we would run the risk of having to change our meeting night on very short notice to suit the convenience of some convention, dance, or social dinner. The Meetings Committee is making arrangements to find a suitable, centrally located meeting place. This month's meeting, as previously mentioned, will be held in the General Motors Building. We will hold a dinner in connection with this meeting and hope to see a large membership present. Regular notice of this meeting will be found under the heading of "Next Meeting" in this issue of the Journal. Whether or not the General Motors Building will be selected as our regular meeting place has not been determined but we will undoubtedly have further details presented at our next meeting. In passing, I wish to state that we have always received kind, courteous, treatment at the Detroit-Leland Hotel both from the management and the employees and it is with regret that we find it necessary to select a new meeting place, but feel sure that our Meetings Committee will provide us with an equally good meeting place. Let's all arrange to attend this month's meeting and bring one or more friends along to enjoy both the dinner and meeting.



Engine lathe bed rigged up by Kraetke Brothers in 1922 for diamond-boring Cadillac crankcase. This is one of the first instances of diamond boring on a production basis in the automotive industry.

(Continued from page 5)

The first drills and boring tools were all flat point or fly cutting tools. The first holes of dependable size came with the development of the spiral drill. Our first published reports of the spiral drill were in 1822. From data available, this tool was first invented in England.

In America, Stephen A. Morse founded the Morse Twist Drill and Machine Company in 1862, and was the first to produce spiral drills in practical and quantity production.

While for a short time the twist drill gave us superior accuracy over past methods, it was not long before we find the finishing of holes by fly cutting after drilling, for greater precision and finish.

The reamer was our next development for sizing holes and was originally developed as a multiple tool fly cutter. However, it was found that a reamer had the tendency to follow its rough hole so that it became common practice to run a fly cutter ahead of a reamer in holes where roundness and straightness of hole were factors.

The advent of the automobile found the reamer in use and its adoption by production manufactures for sizing of holes followed naturally. The automotive industry also furthered the development of the broach as a rapid production method to obtain hole size.

The development of high speed motors together with improvement of roads allowing higher driving speeds brought the demand for a higher finish in holes and a much greater accuracy of alignment and squareness of holes with their faces.

The hone was introduced to obtain the higher surface finish, but honing was not successful in correcting to any great extent the straightness of holes.

The use of the diamond tool for securing a fine surface finish, as well as straightness and roundness of hole had been known for years and was quite common practice in tool rooms for finishing bronze bearings where reamer chatter and tearing was objectionable. During the war, in the development of super accurate optical instruments, we find the first application of the diamond as a fly cutting tool in production.

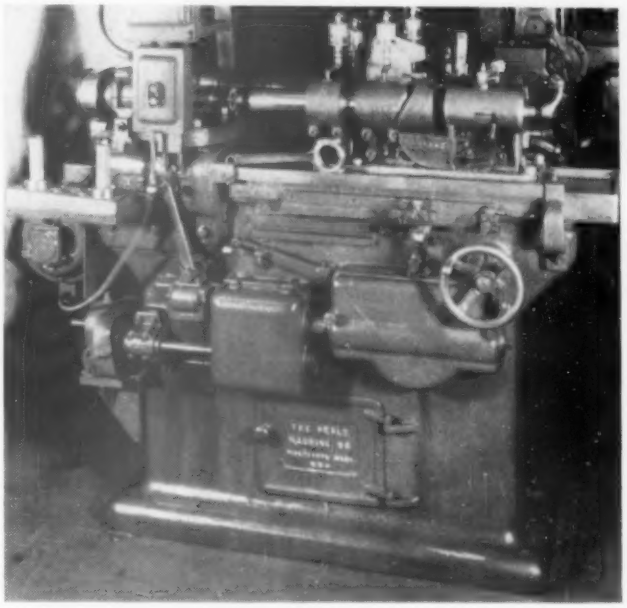
The first attempts to use the diamond were rather expensive for the machine tools then developed were not sensitive enough to prevent the breaking of the diamond. Some manufacturers, notably Baush and Lomb and Kelvinator, turned to the development of their own machines to obtain satisfactory results. In Detroit, several manufacturers developed their own special boring machines for precision work.

Meanwhile engineers who had previously thought only of thousandths now began to demand and obtain tenths of thousands in their limits of production. The accuracy required could not be obtained by old methods and fly cutting or precision boring again entered the field. At first the requirements were only on the soft non-ferrous alloys, brass, babbit and aluminum. Mechanics learned to dress the industrial diamonds into cutting tools. Two objections to their universal use however, remained; first, the structure of the diamond, and second, the fixture of the machinery.

As you know the diamond is an irregular octahedron crystalline form of carbon. With the cleavage planes running in all directions, great care must be exercised in the dressing of the diamond in relation to its cleavage planes. The stones are fairly expensive and redressing after a fracture is a delicate and expensive operation, and furthermore the diamond was not found to be practicable in the ferrous metal field.

Fortunately during the time that the demand for greatetr accuracy had been going on there was being developed a cutting material nearly equal in hardness to the diamond, the tungsten carbide tool.

The tungsten carbide was developed in 1920 by the Ozrum Lamp Works of Germany, a subsidiary of the International General Electric. It was primarily developed for use as a wire drawing die to replace the diamond dies used in drawing the fine wire filament used in electric lamps. It was quite successful in drawing dies and attracted the attention of the Krupp Works who in 1926 started to market, the material, under license, with the trade name of "Widia," derived from Wie Diamant (like diamond), for use as a cutting tool. About the time of the introduction of Widia into the U. S. in 1928, the Carboloy Company was formed to manufacture under the same license in the United States. Since that date the development of this new group of cutting tools has been very rapid.



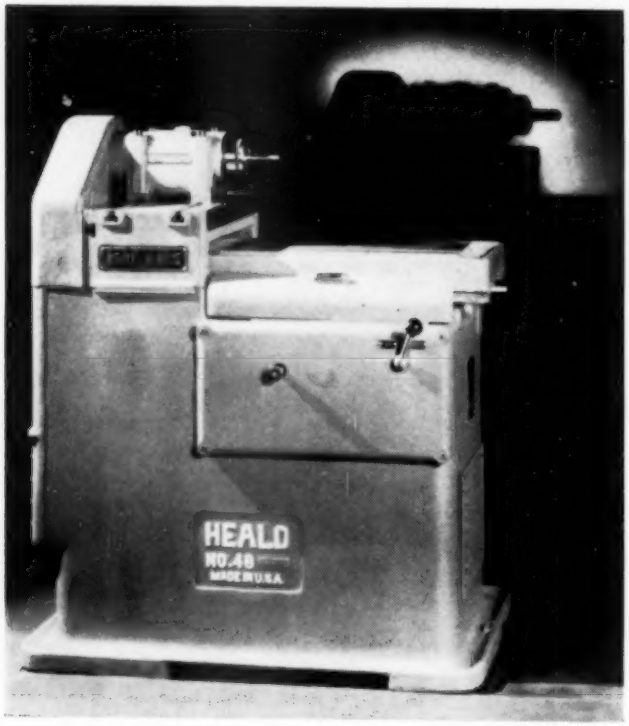
1924 Heald internal grinder rigged up for diamond-boring connecting rod. The automatic features of the standard grinder are incorporated here for the first time to speed precise hole production.

The original material was a compound of tungsten and carbon transformed into tungsten carbide. This tungsten carbide was ground into fine particles and carefully mixed with cobalt which was used as a binder. Pressed into shape in moulds under hydraulic pressure it was then heat-treated to give the required hardness. Today the various products manufactured commercially include not only tungsten, but tantalum and titanium with the addition of molybdenum, nickel, manganese and many other minerals; each combination having a special characteristic which specifies its usefulness for cutting various materials under variable conditions. Naturally, the combination of materials used in the manufacture of these metals is guarded as carefully as possible by the many concerns manufacturing the new cutting tools.

With the wide selection of cutting tools from the diamond through the various carbide tools, there still remained the question of a suitable machine to produce the accuracy and

"See page 6 for important next meeting announcement."

finish desired. In addition to the precision required in building the machine, the tools used are quite sensitive to shock and one of the first requirements of a precision boring machine is the elimination of all vibration.



1934 Heald Bore-Matic—One of the latest precision boring machines, designed throughout for the most precise work. (*This is from an unretouched photograph. Note the artistic effect and accuracy of detail obtained by proper distribution of high-lights and shadows.*)

The newer cutting tools allow a much higher cutting speed than that obtained by any of the present high speed steels. This increased speed permits the use of a single point tool cutting at a high rate of speed which, while removing a comparatively small amount of stock per revolution, allows a rapid feed in inches per minute and enables the manufacturer to obtain true holes at the same cost and in many cases at reduced costs over that of reaming and broaching. The upkeep of sizing tools is expensive. Precision boring eliminates the expensive sizing tools by substituting a comparatively cheap tool readily sharpened and with easy adjustment to maintain size.

In the analysis of the basic requirements of a machine to meet the requirements of precision boring it was recognized that the demand was for equipment to produce:

1st. Holes that are duplicates in size within very narrow limits.
2nd. Holes that are both round and straight.
3rd. Holes that maintain the proper relationship with other surfaces.
4th. Holes that have a satisfactory finish.

The rigid requirements of a machine to accomplish these results demand, first, a spindle which will allow high cutting speed, free from vibration, to insure satisfactory finish for the work and maximum life of the tool and which will not deviate from its true axis; second, a moving member for feed traverse which has sufficient mass and bearing area, accurately aligned, to maintain an absolutely true line of travel; third, motion applied to the moving member which is steady and uniform within a wide range of feeds; fourth, a driving means for the spindle which in itself or in its application is free from vibration yet flexible enough to provide a full range of spindle speeds; fifth, mass and rigidity in the machine proper to maintain relation between the fixed and movable members and resist the effects of external vibration.

It is interesting to note that the above factors have long been required in the internal grinding field and it is natural that in the eearly steps, to produce a satisfactory precision boring machine, some of the grinder units were first utilized.

The development of a precision boring machine would be useless without the proper cutting tools. These tools must wear so slowly at high speeds that the wear can be readily compensated for. Diamonds originally used exclusively in this field are expensive in first cost and in upkeep and are limited to a great extent to the softer alloys. The carbide tools, whose development has been rapid, have in many cases supplanted the diamond. The development of the tool shapes and mounting of tools has paralleled the development of the machine itself, so that the advance into new materials and shapes, that can be bored, has been most rapid.

Tool shape is, of course, important but equally important is the sharpening of the tool and the maintaining of a true cutting surface. The new cutting materials, being a bonded mass and not an alloy, present an edge of alternate hard cutting particles and the softer bonding materials. For machining the softer materials especially, it is essential that the cutting particles be lapped to a true surface with the bond in order to maintain finish. To obtain this tool surface and maintain accurate tool shapes it was necessary to develop special tool sharpening machines, which would duplicate rakes, clearances and tool edges.

With this background of the requirements of machine and tools for precision boring, Mr. Schneider presented lantern slides of some of the first boring machines built and of other machines developed through the years up to the latest.

He also showed slides of a number of applications of precision boring and described the development of the machines. He also gave much additional valuable information.

USED MACHINERY DEALERS ORGANIZE

Mr. L. G. Bradley of The Brad'ey Machinery Company reports the organization of machinery dealers under the N R A code as follows:

"It will be of interest to the members of the A.S.T.E. to learn that a successful attempt has been made to organize the Used Machinery Dealers in Michigan.

"The used machinery business a few years ago had fallen somewhat into disrepute. However in later years certain dealers endeavored to offer with the sale of used machinery genuine sales engineering service and a desire to be of valuable assistance to the automotive trade in general.

"Occasions arise when the Tool Engineer in order to maintain production is unable to wait for delivery of a new machine. He is then forced to call upon some used machinery dealer to try and fill his needs. He incidentally has little time to spend in inspecting the equipment he requires and if he can explain his needs to a dealer who understands them and can place an order with a feeling that the machine he will receive is as represented he is likely to feel more kindly disposed towards the used machinery business as a whole.

"In accordance with the NRA code the used machinery dealers in Detroit decided to form an organization. They now have a membership of twenty-seven. A code of fair competition has been drawn up and the organization should give the customer a long needed protection against misrepresentation of equipment.

"When describing machinery members of the Association have agreed to adhere to specific classifications offering a piece of machinery either as:

1. Absolutely rebuilt with specific rebuilt requirements.
2. In good operating condition.
3. As is.

"We feel sure that the Organization will be of valuable assistance to Tool Engineers in general in Detroit and locality.

"Any further information relative to the appraisal service and activities of the Organization will be submitted by the writer."

"See page 6 for important next meeting announcement."

TECHNICAL

JOHN M. CHRISTMAN RAYMOND J. WALTER W. J. McKEEN

STRENGTH OF MATERIALS TORSION IN SHAFTS

By W. J. McKEEN

(Continued from last issue)

IN the January issue of the Journal, torsion in shafts was considered; polar moment of inertia and external twisting moment explained.

The formulae given did not take into consideration the bending forces acting on the shaft.

When a pulley or gear is some distance from the supporting bearing (which should not happen if it can be avoided) the thrust of the tools or pull of the belt at the periphery or, in heavy machinery, the weight of the part itself acts to bend the shaft as any weight would on a supporting beam, so that we have a bending moment as well as a twisting moment. An equivalent twisting moment is used to take the place of the twisting and bending moment. This is sometimes known as the Ideal Twisting Moment.

The formula by which this moment is found is derived from higher mathematics, but its application does not require a knowledge of the same.

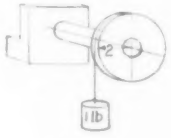


Fig. 1

T^1 — Equivalent Twisting Moment
T — External Twisting Moment
M — Bending Moment for Section

$$T^1 = M + \sqrt{M^2 + T^2}$$

The external twisting moment and its derivation were explained in the last article. M is most easily found in the table of bending moments to be found in any handbook.

To design a shaft for any condition the bending moment and external twisting moment must be found. From these the equivalent twisting moment is found.

By transposition of the formula for polar moment of inertia the following formula is derived for the diameter of shafts:

$$d = \sqrt[3]{\frac{16\ T^1\ f}{\sqrt{3.1416\ Ss}}}$$

d — diameter of shaft
f — Factor of Safety
T — Equivalent Twisting Moment
Ss—Ultimate shearing stress of mat'l.
Consider Fig. 1.

Let the weight shown be 100 lbs. and the radius of pulley be 2 feet, the distance from the fixed end of the shaft to the center of the pulley — 10 inches.

f = 20 Ss = 70,000

To find the diameter of the shaft.

External twisting moment is $100 \times 24 = 2400$.

In the table of bending moments we find that M for a weight suspended from the end of a cantilever beam, — which is the condition in our problem, — is derived by multiplying the weight by the length of the beam which will be

$10 \times 100 = 1000$ in—lbs.

Equivalent twisting moment

$$= T = M + \sqrt{M^2 + T^2} = 3619, \text{ nearly.}$$

The diameter of the shaft will be

$$\sqrt[3]{\frac{16 \times 3619 \times 20}{3.1416 \times 70{,}000}} = 1.737 \text{ in.}$$

The nearest standard size is 1¾" dia.

It will be seen from this example that the pull of the weight in Fig. 1 corresponds to the thrust of a gear tooth or pull of a belt.

This article has dealt only with the case of an overhanging shaft. Other conditions will be discussed later.

DESIGN OF HYDRAULICALLY OPERATED AUTOMATICALLY CONTROLLED, MULTIPLE SPINDLE HEAD DRILLING MACHINE

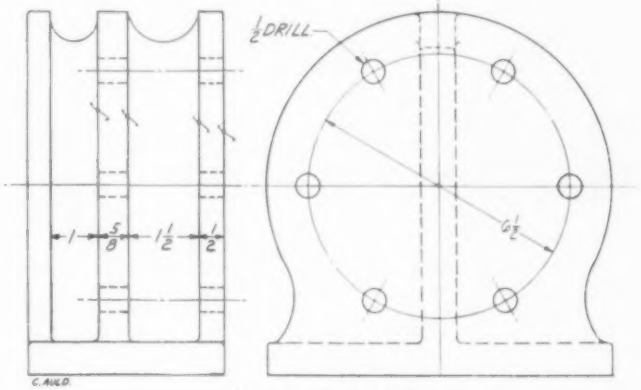
By RAYMOND J. WALTER

(Continued)

IN these few short articles it has been almost impossible to give a detailed description of every part of this machine, so I have tried to give information on only the most important details. In this, my concluding article I will cover briefly the working of the hydraulic mechanism which feeds the drill spindle.

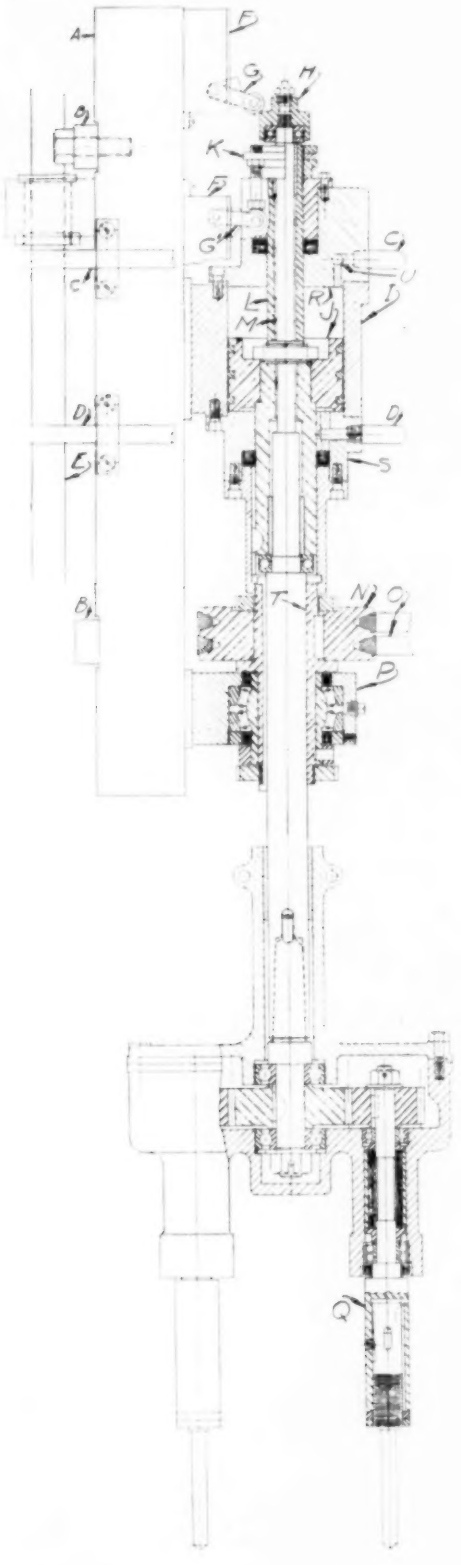
To start with, we must determine the pressure required to drill the holes. You may recall that we are drilling six ½" holes through a steel casting as shown in the small figure. The first thickness to be drilled is ½". The drills proceed through an open space of 1½" and then pass through the lower wall which is ⅝" thick. The pressure required to drive each drill is found in a handbook to be 750 pounds. The total pressure to be exerted by the hydraulically operated piston is six times this figure since there are six spindles. A pump and piston must therefore be used which develop a total pressure of 4500 pounds.

A solenoid control valve is used in conjunction with limit switches situated at F in the large figure to control the spindle.



Piece to be drilled.

"See page 6 for important next meeting announcement."



I shall name the various parts and assign letters of identification to avoid confusion in the explanation which follows. The multiple spindle is Q, main drive spindle is M, the drive pulley with two V-belt grooves is N. The journal box containing a roller bearing is P, the cylinder is I, with the piston being listed as J. Upper cap inlet is R, lower cap inlet is listed as S, control lever arm as G, control cap as H, outer drive sleeve as L, forward stroke pipe as C, reverse stroke pipe as D, adjusting screw as E, base as A, clamps as B, and the lower sleeve as T.

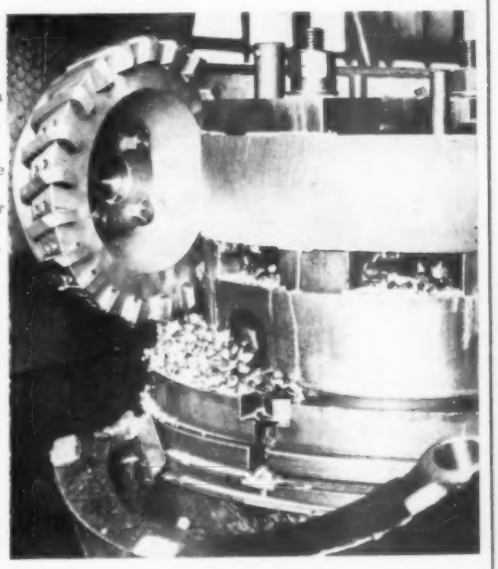
The operation of the spindle is as follows: There must be a set of button switches conveniently located for the operator, one of which he will press to start the oil flowing through pipe C which will in turn start the piston moving forward at the required speed. The speed of piston travel is controlled by the control pin located at U. The spindle should, of course move forward rapidly until the drills come within 1/8" or 1/16" of touching the metal then it should be retarded to a feed of .010" per revolution of the spindle. This feed should be constant until the drills are through the first thickness of metal, and then should be speeded up until the drills are ready to drill through the lower wall. After the drills are through the second wall the control arm G will act on the limit switch reversing the four-way valve when the oil will flow through pipe D in such force as to return the spindle rapidly to its starting position where control cap H will act on limit switch F, shutting off the flow of oil until such time as the operator pushes the starting switch.

During the reverse stroke the oil, which comes in through pipe C on the forward stroke will return through the same pipe and flow back to tank for use again. The same performance is repeated when the oil is flowing through pipe D for the forward stroke. The oil at the head of the piston will return through pipe D.

Here's A Job "Production"

Inserted Blade Milling Cutters Helped Make Possible

Illustrated is a *"Production"* Inserted Blade Milling Cutter on the job in one of the country's largest automotive plants.



PRODUCTION TOOL CO. OF AMERICA

6474 Legrand Whittier 6717 Detroit, Michigan

"See page 6 for important next meeting announcement."

COST-SAVING POSSIBILITIES OF CEMENTED CARBIDES IN THE AUTOMOTIVE INDUSTRIES

By M. E. KNOLL,
Carboloy Company, Inc.

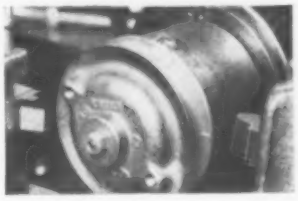
THE Automotive Industry, perhaps more than any other industry today, has, in the cemented carbides, the opportunity for obtaining large savings in machining costs. Although cemented carbide tools can and are effecting savings on extremely limited job-lot work, in some cases even on the machining of diversified single-lot parts, it is a known fact that Carboloy cemented carbide more nearly approaches its ultimate in cost-saving possibilities on straight production, quantity work, such as that found in automotive production.

Tool engineers in the automotive plants were among the first to recognize the unusual order of economy possible with Carboloy tools. Starting from practically the first month in which Carboloy cemented carbide was introduced, these engineers have exhaustively investigated and applied the carbides until today cemented carbides are being used more extensively in the automotive industries than in any other field.

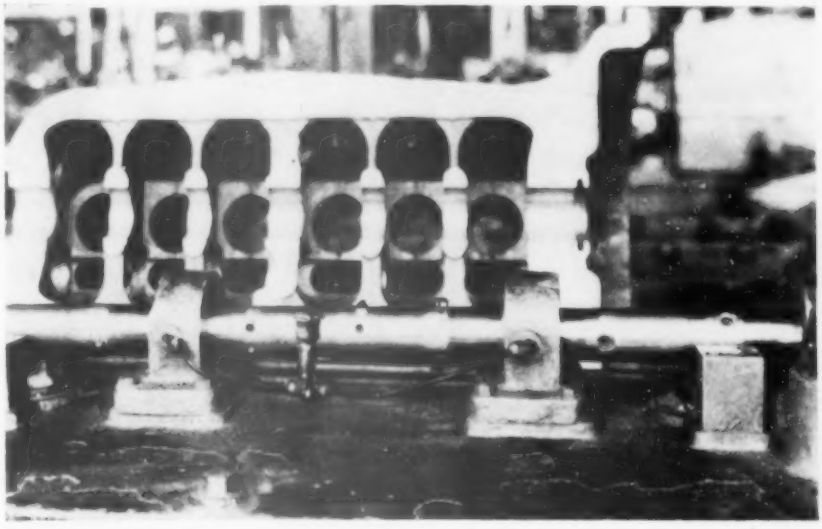
To such an extent is this true that today a summarized census of all the important automotive plants would reveal that practically every major machining operation, with the exception of steel applications, has been tooled with cemented carbide in one plant or another. Some indication of the many diversified applications of cemented carbide in the automotive industries may be obtained by the following list. The list is by no means complete but is intended to present a representative cross-section of successful carbide applications in automotive production.

REPRESENTATIVE CARBOLOY TOOL APPLICATIONS IN THE AUTOMOTIVE INDUSTRIES

Part	Material	Operations
Bearing Retainers	Cast Iron	Face, turn, bore
Brake Drums	Cast Iron, Steel, Gun Iron, Etc.	Bore, face, turn
Bushings, Transmission	Bronze	Bore
Bushings, Flange	Bearing Bronze	Turn, face
Bushings, Interm.-Speed Gears	Nickel-Phosphor Bronze	Finish groove
Bushings, Valve Guide	Cast Iron	Broach, turn
Camshaft bearings	Cast Iron	Bore, straddle face turn and groove
Carburetor	Cast Iron	Ream, spot face, counterbore
Clutch Facing	Multibestos	Counterbore
Clutch Housing	Cast Iron	Turn, face
Clutch Release Bearing	Steel	Turn
Connecting Rod Bearings	Babbitted	Flycut
Connecting Rod (Crank-end hole)	Steel	Finish bore
Connecting Rod (Piston-pin hole)	Bronze	Finish bore
Crank Pulley	Cast Iron	Bore, face, groove
Crank-Shafts (Aircraft)	Aluminum	Bore and face
Cylinder Block	Cast Iron	Flycutting main bearings, valve head opening and hole for stem bushing; milling all sides; semi-bore and finish cylinder walls; bore oil pump and crank holes.
Cylinder Heads	Aluminum	Mill
Cylinder Heads	Cast Iron	Mill
Die Cast Door Fixtures	90% Zinc	Spotface
Distributor Cap	Cast Iron and Bakelite	Turn
Distributor Body	Cast Iron and Bakelite	Turn, bore

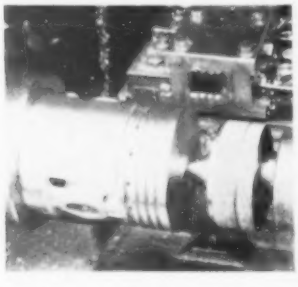


Grooving Cast Iron Fan Pulley



Carboloy Equipped Boring Bar for Fly Cutting Main Bearings

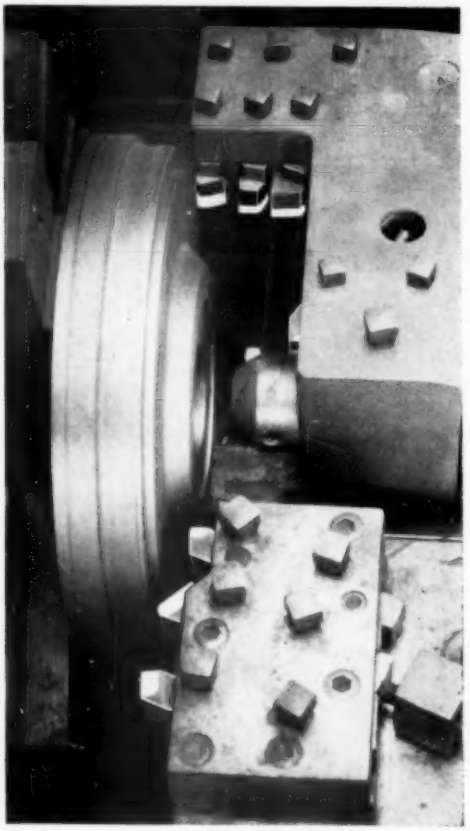
Turning Piston Rings



Set-up for Grooving Aluminum Pistons

"See page 6 for important next meeting announcement."

Exhaust Manifolds	Cast Iron	Mill
Exhaust Intakes	Cast Iron	Mill
Fan Pulleys	Cast Iron	Form groove
Flange,—For Clutch Throw-out Fork	Cast Iron	Turn and Face
Flywheels	Cast Iron	Turn, face, bore
Flywheel housing	Cast Iron	Face, bore
Gears	Steel	Turn and bore
Gear Housing Covers	Cast Iron	Bore, face
Generator Pulley	Cast Iron	Bore, face, groove
Idler Gear	Steel	Turn
Magneto Flywheels	Cast Iron	Flycut
Oil Pump	Cast Iron	Turn, bore
Pistons	Aluminum Alloy (Lo-Ex) and cast iron	Turn, face, groove
Piston Rings		Turn
Propeller Shaft Housings	Malleable Iron	Bore
Shock Absorbers	Cast Iron	Bore
Steering Gear Cases	Malleable Iron	Spot-face
Steering Wheels	Hard Rubber	Counterbore and face
Timing Gears	Steel	Face
Timing Gears	Bakelite	Turn, face, bore
Transmission Case	Cast Iron	Bore, ream, face
Transmission Case Bearing Cap	Aluminum	Bore
Transmission Gears	Steel	Turn
Valve Cover	Cast Iron	Mill
Vibration Damper Wheels	Cast Iron	Face
Water Pump Bracket	Cast Iron	Mill
Water Pump	Cast Iron	Bore and face
Wrist-Pin	Steel	Chamfer, face



Carboloy Tools Set-up for Machining Fly Wheel

This extensive list, representative but by no means complete, should serve to indicate that the cemented carbides have definitely passed the experimental stage and are now a vital part of the machine production work. It should serve as at least partial fulfillment of the prophesy made early in cemented carbide history by a well-known economist, who said!— "those industries engaged to any appreciable extent in machining metals have had put at their disposal an external economy — Carboloy — which should entrench them in their leadership among American industries — —"

The tool engineer plays a major part in seeing that cemented carbides are made to realize the full possibilities of this prophesy in his particular plant.

ADVANCE INFORMATION ON THE ECLIPSE RADIAL DRIVE COUNTERBORE

The constant trend toward mass production of machined parts requires heavier machinery, stronger tools and more alert engineering. The machines and tools of ten years ago, and five years ago, and even more recent, are being obsoleted and in many cases, discarded for later improvements. Eclipse engineers specializing on counterboring, core drilling and multi-diameter boring tools, awake to these facts, long ago commenced developing a super strength driving system for end cutting boring tools to meet the greater demands of present day manufacturing practices.

The Eclipse super-strength Radial Drive is a result of their efforts. It is now presented to the manufacturing trade after continuous testing on severe production operations. We sincerely believe that its practical design will merit your consideration for high production, counterboring, countersinking and multi-diameter boring tools. It is backed by the Eclipse organization and its reputation for good workmanship and service.

The Radial Drive is a complement to the Eclipse pin drive which has been practically a standard for interchangeable countetrbores and end cutting tools in most manufacturing plants for the past twenty years.

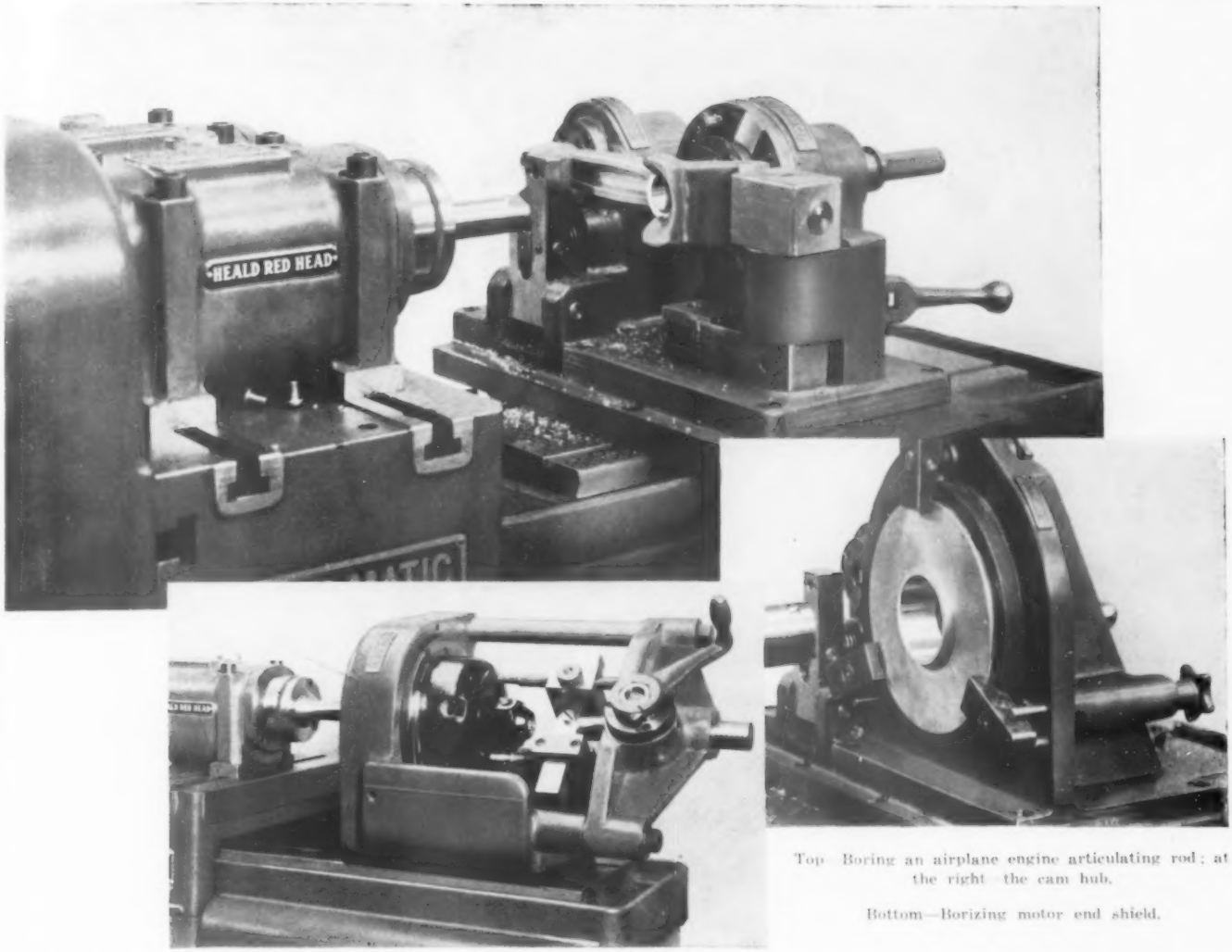
The new Radial Drive Counterbores have blades which are ⅛" longer than those of our present pin drive counterbores; however, the present Eclipse pilots are intetrchangeable in the new Radial Drive Counterbores. Larger pilot holes are provided in the cutters (size for size) consequently stronger pilots can be used because of the large diameter pilot shanks.

The new Eclipse Radial Drive Counterbore will be completely listed and described in our new catalog to be published early in 1934. Patent protection has been definitely assured.

Prompt deliveries of both Eclipse radial drive and bayonet lock counterbores are maintained fro mour company-owned modern factory at 7410 St. Aubin Avenue, Detroit, Michigan. We maintain direct factory representation in all manufacturing centers.

"See page 6 for important next meeting announcement."

Boring with Precision and Economy



Top—Boring an airplane engine articulating rod; at the right the cam hub.

Bottom—Borizing motor end shield.

THE No. 48 Heald Bore-Matic is filling the needs of many manufacturers where there is a demand for close precision at a low cost. Precision is the watch word among the makers of airplane engines. As shown above, at the plant of this engine manufacturer, the No. 48 was selected to borize the articulating rod and cam hub. It also handled the master rod.

While precision also is a vital factor in the finishing of the bores of end shields for motors, in addition, there is demanded low cost for the operation. On this job, the No. 48 has given such satisfactory results that it warranted the purchase of several of these machines for this work by one of the largest motor manufacturers.

Simply constructed, easily operated, having a capacity of one or two boring heads and purchased at a nominal investment, makes the No. 48 an ideal tool. This applies to either the manufacturer with small lots and a variety of work or, in the case of mass production, by keeping one machine continuously on one job even though it is not in operation all the time, it insures a perfect set-up giving complete satisfaction and is more economical than a double end multiple spindle machine.

The Heald Machine Company, Worcester, Massachusetts, U. S. A.

Branch Offices at Chicago, Cleveland, Detroit and New York

HEALD

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NEW MACHINES

HAROLD GILLER B. L. DIAMOND

GEAR GRINDING MACHINE

QUIET operating gears are very essential in many types of machinery. Where the elimination of gear noise is necessary or desirable the Formed Wheel method of gear grinding sponsored by The Gear Grinding Machine Company of Detroit has several distinct advantages.

In grinding gears by this method, expensive finishing cuts prior to heat treating can be eliminated as the final grinding will take care of variations in rough cutting and heat treating distortions.

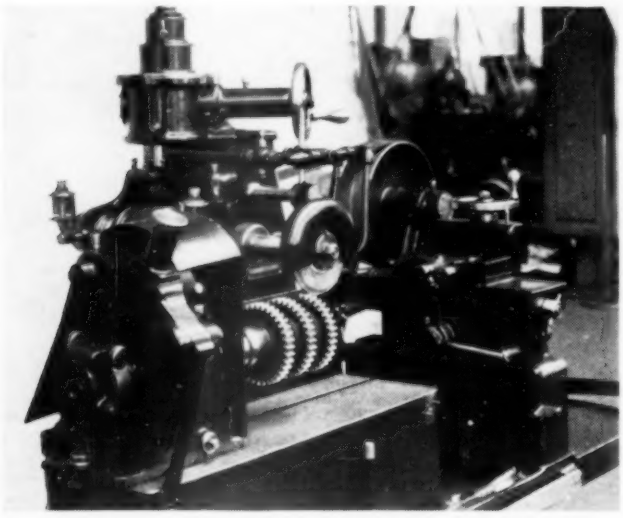
The grinding operation may be used to salvage improperly cut-gears that would normally be scrapped.

The formed wheel method utilizes a grinding wheel formed, to the exact size desired, by diamond cutters which are integral with the machine.

The gears to be ground are mounted between centers or on an arbor directly connected with an indexing head located on the machine table. The table is hydraulically reciprocated and the grinding wheel as it passes between the gear teeth, grinds both sides and the bottom of the space at each stroke. The gears are indexed one space at the end of each stroke of the table by an index mechanism which is operated hydraulically through a large plate having accurately ground gashes in its periphery.

After the gears are mounted on the machine a roughing cut is made completely around the gear and then repeated until the teeth are about .001 inch over finished size. The grinding wheel is then retrimmed and the gear finished—the same trim answering for rough grinding the next gear.

The accompanying photograph shows a cluster of spur gears ready for grinding. This same method is used for grinding helical gears and also for spline grinding.



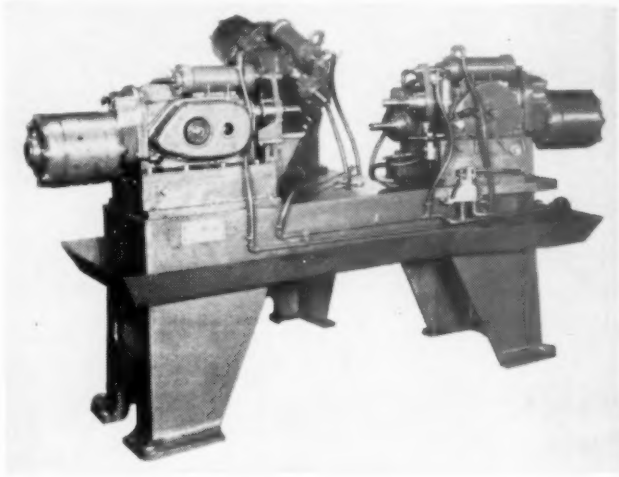
MILLHOLLAND HEAD ADAPTATIONS

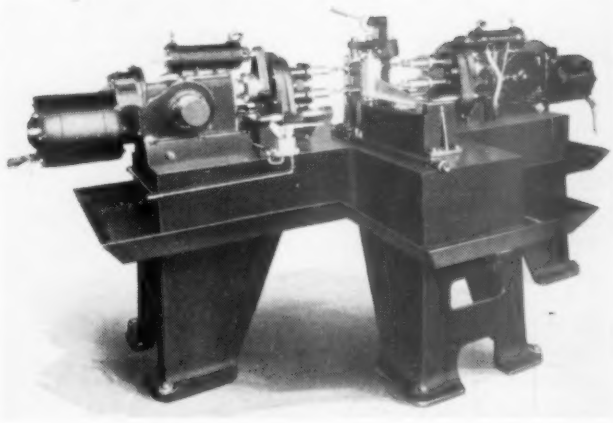
Millholland Sales & Machine Company, Indianapolis, Indiana, presents examples of machine construction, using Millholland Automatic Self Contained Drilling Units.

The first example shows four Millholland Units mounted on a 3-way bed. Adapter bases of different heights and angles permit simultaneous operation of all Units, without moving piece or fixture, to get all holes drilled.

All Units are started simultaneously by means of Ross air valve, but each Unit is independent and completes one cycle and stops automatically. Positive cam feeds are used, giving an 80% efficiency in the cycle, only 20% of cam surface used for quick approach and return. To figure the operating time on Millholland Units, the actual cutting time of tools divided by 80% gives the complete cycle time.

The second example shows the same three way bed, used as two way machine, with one wing of bed supporting a long fixture. The beds used can be constructed by casting or welding, or beds of old machines can be utilized.





By means of Unit construction, special machines can be constructed with use of Millholland Units in exceedingly short time and at surprisingly low cost.

An engineering service of the manufacturer provides dimensional blue prints of the various sized Units which range in size from ¼ HP drive to 10 HP drive. Standard attachments for accurate boring and milling are also available for use with Millholland Units. Dimension prints of these attachments and also of various types of machine bases are also available for use of tool engineers in laying out projected machines.

"See page 6 for important next meeting announcement."

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NEW TOOLS AND PROCESSES

B. L. DIAMOND HAROLD GILLER

UNIVERSAL DRILL JIG

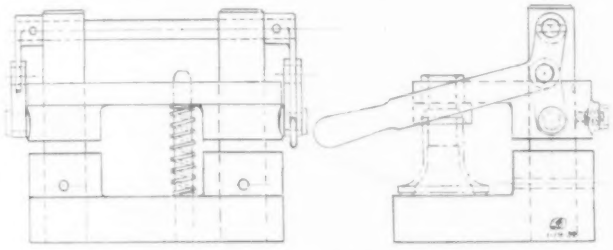
By B. L. DIAMOND

A TOGGLE clamp, one of the oldest devices for obtaining great force with a minimum of effort, yet, I have never seen the arrangement as sketched, so we are showing it as a new tool.

If you have seen this used before, we would be interested to know where and when.

This is effect is a "pump jig." The body is a standard die set, with long guide pins. The arrangement of the toggle for a clamping unit is, I believe, plainly shown. The weight of the bushing plate,—or should I say punch holder?—is counter-balanced by a spring which, however, is not strong enough to offer any resistance to the clamping action.

The bushing plate is held in the open, or upper position by a spring plunger.



NEW GRADE OF TRUING TOOL FOR MORE DIFFICULT JOBS

Carboloy Company, Inc., Detroit manufacturers of metal cutting tools and grinding wheel truing tools recently announced the development of a new grade—Grade 300—to supplement the two present grades of diamond-impregnated truing tools for finish dressing. With the addition of this new grade 300 the line of Carboloy Truing Tools now cover practically the entire range of finish dressing jobs. Each of the grades contains a specific type of diamond with grade 300 having the best quality stones to accommodate the more difficult dressing jobs.

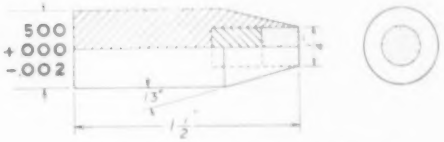
A further development is the sub-division of each grade into three groups based on the mesh size of the diamond particles used. These are classified as follows:

Mesh size of stones:	Fine	Medium	Coarse
Grade 100:	101	102	103
Grade 200:	201	202	203
Grade 300:	301	302	303

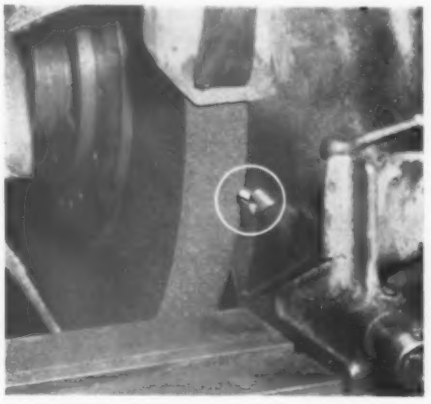
This choice of mesh sizes considerably increases the range of work which can be done by any one particular grade and in many cases enables the user to successfully apply a lower-priced grade than would be possible were only one mesh size available. Similarly, the three grades of stones now available offer opportunities for economies as the user may select the exact grade most suitable for his work, eliminating the necessity of purchasing more expensive stones when less costly ones will do the job satisfactorily.

The original Carboloy Truing Tool was announced over a year ago and has since been applied extensively in industrial plants employing grinding wheels for production work. It is unique among existing types of truing tools in that it consists of an extremely hard matrix—next to the diamond itself in hardness—throughout which a large quantity of diamond particles have been distributed, providing a multiplicity of sharp cutting points at each new surface reached. No remounting or other maintenance is necessary throughout the life of the tool. Literature describing the Carboloy Diamond-Impregnated Truing Tool may be obtained by addressing Carboloy Company, Inc., 2483 East Grand Blvd., Detroit, Michigan.

Carboloy Truing Tool Nib inserted in holder for hand truing.



Carboloy Truing Tool Nib inserted in holder for machine truing. Any standard holder may be used.



Showing Carboloy Truing Tool set up for dressing operation.

MISNOMERS(?)

A Draftsman is a man wh puts the ideas of others on paper so no one can understand them

A Designer is a collection of erroneous ideas surrounded by the boss

A Checker is a man with a little red pencil and no conscience

A Data book is a collection of information no one needs

A Blue Print boy is a skunk with a dirty neck who smokes cigarettes, watches the clock and sometimes makes a print

An Engineer is a celebrity who refuses to recognize his own ideas when he meets them on paper

A Tracing is a piece of linen used to wear out erasers

A Blue Print is a maze of lines and figures used to confuse the mechanic

A Tracer is a fellow whose chief occupation is wasting expensive linen and good ink

A Trouble Man is just that

A File Clerk is a boob who defaces drawing and keeps up the constant demand for draftsmen by mislaying drawings.

A Detailer is a boob who copies the Ideas of others to be changed

"See page 6 for important next meeting announcement."

WESSON'S NEW CATALOG

The Wesson Company have published a new catalog covering their entire line of counterboring tools, tool holders, tungsten carbide tipped cutting tools, lapping machines and machine vises. A copy of this catalog may be had by addressing the Wesson Company, 1050 Mt. Elliott Avenue, Detroit, Michigan.

Mr. J. H. Smith, president of the Wesson Company, was for fourteen years connected with the Eclipse Counterbore Company. While with that company he designed and patented a number of labor saving tools now manufactured by them.

Mr. Smith has a number of patents to his credit, chief of which is the first practical solar motor, automatic scale, physical exercising machines, telephone, and gas heating appliances. While serving in France during the war, he designed and presented to the British War Office a self-recording automatic target.

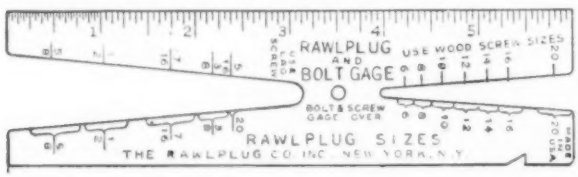
NEW SCREW AND BOLT GAGE

Rawlplug for any given wood screw or lag screw, The Rawlplug Company, Inc., General Offices and Works, 98 Lafayette St., New York City, and branches in all parts of the United States, has just developed something entirely new in the form of a gage.

It is a gage which, upon inserting a wood or lag screw between the jaws or slots, will instantly show what size Rawlplug should be used, and vice versa.

It is made of heavy polished, anti-corrosive steel six inches long by one and five-eights inches wide, which allows it to fit into the pocket or a kit.

One face shows all standard wood and lag screw sizes and give sthe corresponding sizes of Rawlplugs to be used with each. The other side shows all standard Rawlplug sizes and corresponding screw sizes to be used with each. It is also calibrated in fractions of an inch to determine bolt sizes from 3/16 inch to ¾ inch, can also be used as a caliper on corresponding sizes of round bars.



One edge forms a six-inch rule, graduated by sixteenth inches, and the other forms a five-inch rule with a slot which permits the accurate measurement of counter sunk head screws.

It is the one rule with which you can measure the exact depth of anything as the scale starts on the exact end.

It is, therefore, many gages in one, and the indications are that it will fill a long felt want, and be most popular.

The sale price is fifty cents, but any reader of this paper, writing on their business letterhead and mentioning this paper will receive one free of charge, providing they will send ten cents in stamps to cover mailing charges.

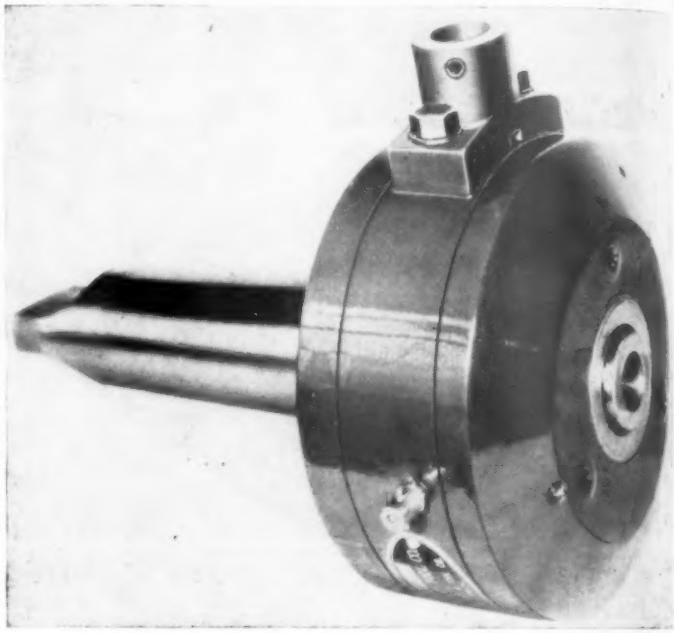
Carboloy Announces Special Grade for Finish Boring Conn. Rods

Carboloy Company, Inc., Detroit, manufacturers of cemented carbide tools have recently announced a special grade of Carboloy designated as X-831. It has been developed specifically for precision work in finish boring absolutely round holes in steel parts, such as connecting rods. With this new grade it is possible to successfully bore an absolutely round hole at practical speeds and feeds and still obtain economical tool life. Some indication of the economical possibilities of Carboloy Grade X-831 may be obtained from its use in finish boring the steel crank-end hole of connecting rods. On this application, production has been substantially increased and costs lowered. Elimination of the grinding operation is an important factor in this.

NEW DRILL SPEEDER UNIT

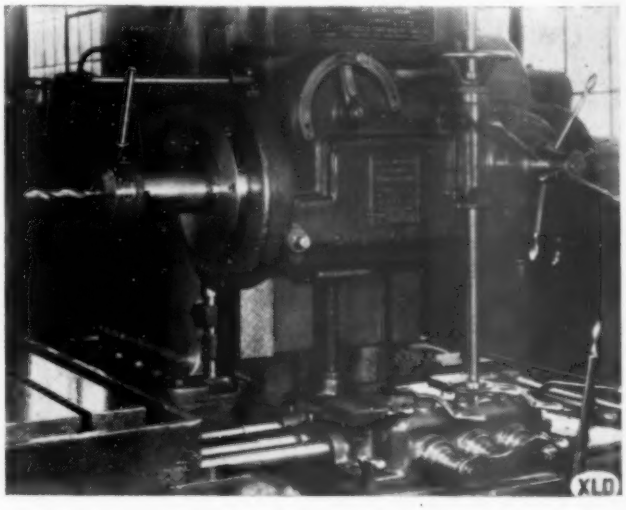
Ex-Cell-O Aircraft & Tool Corporation of Detroit, Michigan, announces the development of a special drill-speeder unit for horizontal boring and milling machines, radial drills and similar machines. With this unit a higher range of speeds can be obtained which is necessary for drilling the small sizes of holes.

Fig. No. 1 shows the drill-speeder unit only, and Fig. No. 2 shows how this head is installed on a boring mill. The driver of the head is furnished with a No. 5 Morse Taper and the drill spindle in the nose of the drill speeder is fitted with a No. 3 Morse Taper to accommodate drills up to 1 1/16" in diameter.



The ratio of the drill speeder is four to one over the spindle speed of the machine on which the unit is used. The maximum speed at which the machine spindle should be operated is 700 r.p.m. which gives a maximum drill speed of 2800 r.p.m.

The unit is provided with a boss on the outside diameter of the head in which a bar is inserted to engage with a suitable bar mounted on any stationary portion of the machine proper, as illustrated in Fig. No. 2. The boss supporting the bar on the machine is furnished with the head. Both bars are to be provided by the customer to fit the machine to be used.



"See page 6 for important next meeting announcement."

NEWS OF INDUSTRY

E. R. DeLUIZ

Russia Places Big Order with the Bullard Co.

Bridgeport, Jan. 2—The Bullard Co., manufacturer of machine tools, has closed an order for nearly $500,000 worth of equipment to be purchased by the Russian Soviet government, according to Edward C. Bullard, vice-president and general manager. The machines will be used in a Russian tractor plant, a passenger automobile plant and in the oil fields.

The order is for 18 separate units of equipment, including several of the company's "Multaumatic" machines. It was obtained by The Bullard Co. from the Amtorg Trading Corp., New York City, in competition with German and British machine tool builders.

John W. Bray, vice-president in charge of sales, said that in addition to the big Russian order, the company has received substantial orders from other countries in Europe and Asia, and many inquiries have been received from domestic sources.

Chicago Steel Mills Expect Large Auto Orders

Chicago, Jan. 2—The recent sharp upturn, which last week boosted operations among steel mills in the Chicago area to 40 per cent of capacity, is expected to continue and the automotive industry will play a more important part than hitherto in maintaining, or even bettering, the rate.

Up to recently, the demands of car manufacturers have not been as important a factor as at times in causing the steady climb in steel mill operations. The major share of orders has come from other sources. It is predicted that the automotive industry is now set to regain its former dominant position as a purchaser of steel.

State Extends Plate Deadline to March 1

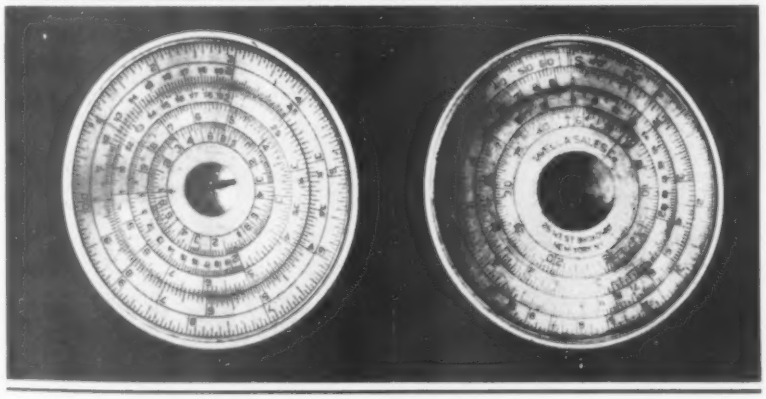
Lansing, Dec. 26—Frank D. Fitzgerald, secretary of state, has extended the deadline for purchase of 1934 auto license plates until March 1. A statement from his office shows that on Dec. 1 there were 57,454 fewer motor vehicles registered than on the same date last year, a total reduction in revenue to the state of $1,142,486. In the last four years registrations have decreased at a rate which has brought a revenue loss of $4,672,893, Fitzgerald said, attributing the drop to excessive cost of license plates.

POSITION WANTED

Draftsman, age 24, initiative; chose tool engineering as a profession; studied mechanical drafting in spare time for the past six years. Recently completed a drafting course and began studying tool designing at the Detroit College of Applied Science. Worked on a variety of shop occupations—now desires job as tool draftsman or detailer. Address, Draftsman, A.S.T.E. Journal, 8203 Woodward Ave., Detroit, Mich.

TASCO CIRCULAR SLIDE-RULE

A metal circular slide-rule designed to be carried in the vest pocket has been placed on the market by the Tavella Sales Co., 25 West Broadway, New York City, under the trade name of Tasco. This rule is made of nickel silver disks, with the lines and figures etched in black. It is grease and water-proof, and should the instrument become soiled, it can be easily washed with soap and water. An advantage of this slide-rule is that it can be dropped, trampled on, or immersed in liquids without being damaged or the accuracy lessened.



This little instrument can be used to multiply two numbers, to divide one number by another, to find a number bearing a certain ratio to another number, to find the square of a number, to find the square root of a number, to find the cube of a number, to find the logarithm of a number, and to find the functions of angles. It is practically indestructible and very reasonably priced.

HATS OFF TO MR. MILLER!

Mr. J. P. Miller, President of the Michigan Gear and Engineering Company reports his Company as deserving a place on the honor roll of tool and machine manufacturers who have been able to take it, as well as give it, over rough or smooth roads with plenty of "knee action" for twenty eventful years.

Mr. Miller has been with the Company the entire twenty years. He was superintendent for the past seven. Contrary to current superstition, the thirteen must have been lucky, and everyone admits that seven is. Such luck with Mr. Miller's natural ability bespeaks many more successful years for the Michigan Gear & Engineering Co.

Any more young twenty-year-old companies? We need the inspiration they give us. Write the Editor about them.

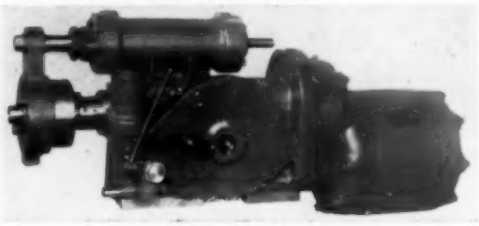
CAUSE OF STATIC IN MOTOR CARS

Automobile Topics, Dec. 16, p. 239.

STATIC interference in motor car radio reception led engineers of the Packard Motor Car Co. to make an extensive search for the cause, with the result that they discovered that this static is produced by the flexing of the side walls of under-inflated tires; by loose fan belts or by dragging brakes. The tires and fan belts with their cotton threads incased in rubber with a "core" of heated air inside of them become in effect dynamos when revolved at high speed it is believed. The dragging brakes are believed to produce static in much the same manner as it is made when a person scuffs his feet along on a heavy carpet.

"See page 6 for important next meeting announcement."

Build Your Own Production Machinery at Low Cost by using



No. 3 Automatic Machine Unit. 3" stroke, 1, 2, 3 H. P.

MILLHOLLAND *Method of Economical Machine Construction*

It is easy to build your own Production Machinery at a LOW COST by mounting MILLHOLLAND SELF CONTAINED MACHINE UNITS on a Table or Old Machine Base which can be found around most plants—or Cheaply Welded Up from Plates and Shapes.

The MILLHOLLAND MACHINE UNITS are self contained—compact—and equipped with Individual Motor Drive; and one or more MILLHOLLAND MACHINE UNITS can be mounted around the work, either in Horizontal—Vertical—or Inclined Positions; and several operations carried on at one time.

MILLHOLLAND MACHINE UNITS are built for Drilling—Tapping—Boring—Milling. Made in sizes from ⅓ HP Motor Drive to 10 HP and can be equipped for Multiple Spindle Operations.

Let Us Show You How to Profit by the Use of Millholland Machine Units in Your Plant

MILLHOLLAND SALES & MACHINE CO. Indianapolis, Ind.

Pioneer Builder Machine Units and Millholland Turret Lathes

THE BLADES of this heavy duty milling cutter are securely locked into the body. And the close-up will show that *good design* alone is responsible. Not only does good design result in positive locking, without benefit of pins or wedges, it takes care of easy adjustment and facilitates close spacing. The basic idea behind the design of O. K. cutting tools is the mating serrations and the tapering shape of the blades.

Good design is evident too in the fact that all O. K. blades are drop forged.

•

The milling cutter shown above is one of a series of four which includes Medium Duty, Heavy Duty, Extra Heavy Duty and Ultra Heavy Duty.

•

We are always at your service to work on special tooling projects . . . Send us the details and we will ssubmit our recommendations and quotation.

DETROIT REP.
H. GILLER
292 CALVIN ROAD TU2-1912

LOCKED . . . .
--by shape alone!

——THE TRADE O K MARK TOOL CO., INC.——
SHELTON CONNECTICUT

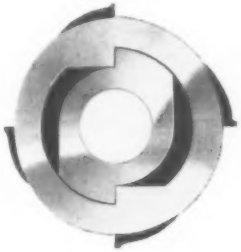
Eclipse RADIAL DRIVE COUNTERBORE

is a result of twenty years' experience engineering and manufacturing thousands of special tool line-ups. It has been tested countless times under the severest of manufacturing conditions on many important production operations.

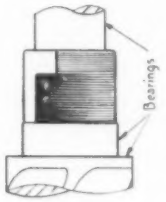
The Eclipse Radial Drive is an interchangeable driving system and is a complement to the Eclipse bayonet lock drive used universally on economical production of machined parts requiring accuracy.

INSURES

Maximum Driving Power
Better Alignment
Increased Accuracy!



Consists of two integral radial drives machined from solid stock exactly on a line through common center of both holder and cutter.



This drive consists of two pairs of radially arranged integral driving faces located between two different sized accurately ground cylindrical aligned surfaces. Ground thrust-bearing surfaces between the holder and cutter maintain alignment. The driving mechanism is machined from the solid and arranged near the cutting edges of the tools, minimizing torque. The radial drive faces eliminate wedging and spreading.

Patent Pending

Radial Drive cutters are furnished in all standard and special sizes from ¾" 4½" in diameter. Send for complete information. Direct factory representatives in all industrial centers.

ECLIPSE COUNTERBORE COMPANY
DETROIT 7410-30 ST. AUBIN AVE MICHIGAN

When you are in the market for RAPID CLAMPING DRILL JIGS why not use the Siewek line of jigs on your next tool up. They are giving great results wherever used. Why not give us a call.

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SIEWEK TOOL COMPANY

2345 Wolcott Street
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TIPPED WITH FIRE

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